ABSTRACT OF THE DISCLOSURE

With respect to the selective ratio in the etching process, it is an object to give design freedom in size of an LDD overlapped with a gate electrode, which is formed in a self-aligning manner, by performing an etching process under an etching condition that has a high selective ratio between a mask pattern and metal such as titanium in forming a first conductive layer pattern. A laminated structure comprising a lower first conductive layer and an upper second conductive layer is formed over a semiconductor layer with a gate insulating film interposed therebetween, a mask pattern is formed on the laminated structure, a condition that an etching rate of the mask pattern is fast is used and the second conductive layer and the first conductive layer are etched to form a tapered first conductive layer pattern, and the second conductive layer in the first conductive layer pattern is selectively etched in accordance with the left mask pattern to form a second conductive layer pattern in which a width of the first conductive layer is longer than that of the second conductive layer.

[Name of Document] Abstract

[Abstract]

[Object] With respect to the selective ratio in the etching process, it is an object to give design freedom in size of an LDD overlapped with a gate electrode, which is formed in a self-aligning manner, by performing an etching process under an etching condition that has a high selective ratio between a mask pattern and metal such as titanium in forming a first conductive layer pattern.

[Solving Means] A laminated structure comprising a lower first conductive layer and an upper second conductive layer is formed over a semiconductor layer with a gate insulating film interposed therebetween, a mask pattern is formed on the laminated structure, a condition that an etching rate of the mask pattern is fast is used and the second conductive layer and the first conductive layer are etched to form a tapered first conductive layer pattern, and the second conductive layer in the first conductive layer pattern is selectively etched in accordance with the left mask pattern to form a second conductive layer pattern in which a width of the first conductive layer is longer than that of the second conductive layer.

[Selected Drawing] Fig. 1

【Table 1】

Lov length (one side)　　unit : μm

mask pattern width	With the treatment of adding SF_6	Without the treatment of adding SF_6
10.0	1.351	0.963

*conditions in the case with the treatment of adding SF_6
ICP/Bias=800/300W, 1.3Pa, SF6/CF4/Cl2/O2=5/20/40/10sccm
* conditions in the case without the treatment of adding SF_6
ICP/Bias=800/300W, 1.3Pa, CF4/Cl2/O2=25/40/10sccm

【Table 2】

condition	parameter	ICP	Bias	Press	CF_4	Cl_2	O_2	P.R E/R		Ti E/R		TaN E/R		P.R/Ti selective ratio		Ti/TaN selective ratio	
								AVE	p.n.u	AVE	p.n.u	AVE	p.n.u	AVE	p.n.u	AVE	p.n.u
		W	W	Pa	sccm	sccm	sccm	Å/min	%	Å/min	%	Å/min	%		%		%
1	basal cond	500	300	1.3	25	40	10	6932	8.5%	3845	5.1%	2662	3.6%	1.81	11.5%	1.44	4.6%
2	Bias	500	100	1.3	25	40	10	6455	5.5%	955	20.7%	717	7.8%	6.92	18.1%	1.33	22.5%
3		500	200	1.3	25	40	10	6764	3.1%	3113	6.8%	1539	4.8%	2.18	7.5%	2.02	5.6%
4		500	400	1.3	25	40	10	7694	3.9%	3598	5.4%	3513	3.8%	2.14	6.9%	1.02	8.2%
5	ICP	300	300	1.3	25	40	10	5188	5.5%	2297	8.2%	2024	6.6%	2.26	4.8%	1.14	10.1%
6		700	300	1.3	25	40	10	8777	8.1%	3809	3.8%	2306	5.9%	2.31	10.7%	1.65	8.3%
7		500	300	1.8	25	40	10	7094	3.9%	4285	6.5%	1747	7.4%	1.66	6.1%	2.46	11.9%
8	Press	500	300	2.3	25	40	10	8654	16.8%	724	25.6%	857	29.3%	12.23	22.8%	0.89	40.4%
9		500	300	3.3	25	40	10	7659	21.2%	2434	23.5%	505	67.0%	3.26	37.2%	6.83	110.4%
10	O_2	500	300	1.3	25	40	15.0	9330	6.5%	464	31.8%	1179	13.4%	21.06	34.7%	0.40	31.5%
11		500	300	1.3	25	40	7.5	6480	3.1%	3832	4.2%	3172	3.7%	1.69	5.5%	1.34	48.1%
12		500	300	1.3	25	40	5.0	6037	4.7%	3480	5.2%	3061	8.1%	1.74	9.9%	1.14	10.3%
13		500	300	1.3	25	40	0.0	5146	13.2%	3091	6.2%	3004	4.0%	1.67	18.1%	1.03	4.1%
14	CF_4/Cl_2	500	300	1.3	40	25	10	6571	16.6%	0	-	1608	9.5%	∞	-	0.00	-
15		500	300	1.3	30	35	10	7150	19.3%	81	140%	2047	5.8%	42.90	20.3%	0.04	134%
16		500	300	1.3	20	45	10	6798	10.8%	4036	4.8%	3344	5.6%	1.69	11.6%	1.21	6.5%
17		500	300	1.3	10	55	10	6238	13.4%	2762	10.8%	4498	5.8%	2.27	21.0%	0.61	9.4%
SF_6 treatment		500	300	1.9	SF_6=56sccm			10724	6.0%	1337	17.2%	-	-	8.11	14.1%	-	-

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condition	parameter	ICP	Bias	Press	CF_4	Cl_2	O_2	P.R E/R		Ti E/R		TaN E/R		P.R/Ti selective ratio		Ti/TaN selective ratio	
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